

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

TWM3431 – DIGITAL WATERMARKING

(All sections / Groups)

13 OCTOBER 2016
2:30 P.M. – 4:30 P.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of SEVEN (7) pages, including the cover page.
2. Answer ALL questions
3. The distribution of the marks for each question is given.
4. Please print all your answers in the Answer Booklet provided.

Answer **ALL** the questions

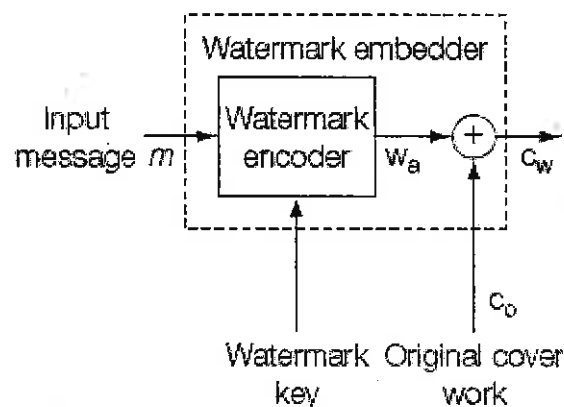
QUESTION 1

- (a) Information hiding conceals the existence of communication. Information hiding, steganography, and digital watermarking are three closely related fields that have a great deal of overlap and share many technical approaches. Compare digital watermarking and steganography using appropriate examples.
[4 marks]
- (b) Paper watermarking appeared in year 1282 in Italy. The marks were made by adding thin wire patterns to the paper molds. Hence, the paper could be slightly thinner where the wire was and hence appeared to be more transparent. What are the purposes of the earliest paper watermarks?
[3 marks]
- (c) Identify the reasons of the importance of digital watermarking in this digital age.
[3 marks]

CONTINUED

QUESTION 2

- (a) Explain the following watermarking applications using your own words:
- i content authentication
 - ii transaction tracking
- [2 marks]
- (b) Distinguish between **exact authentication** and **selective authentication**.
- [2 marks]
- (c) Comprehend THREE [3] basic approaches which can be used in selective authentication.
- [3 marks]
- (d) Watermarking is essentially a form of communications, which communicates a message from watermark embedder to watermark detector. The figure below illustrates the embedding process in a basic model of watermarking.



Propose and explain a blind watermark detector for the above watermark embedder. Use appropriate diagram in explaining your answer.

[3 marks]

CONTINUED

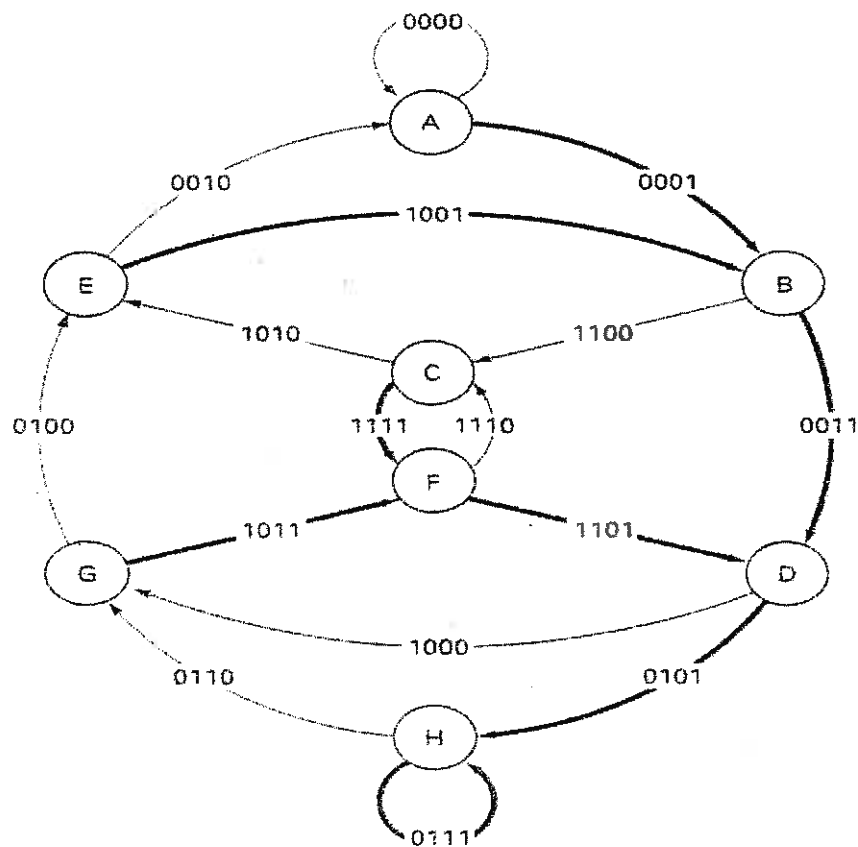
QUESTION 3

- (a) John is assigned to design message marks. With your best knowledge, summarize the key issue of designing message marks for John.

[4 marks]

- (b) Referring to the figure below of Eight-State Convolutional Code, encode a 4-bit sequence of

- i. 1000
- ii. 1101



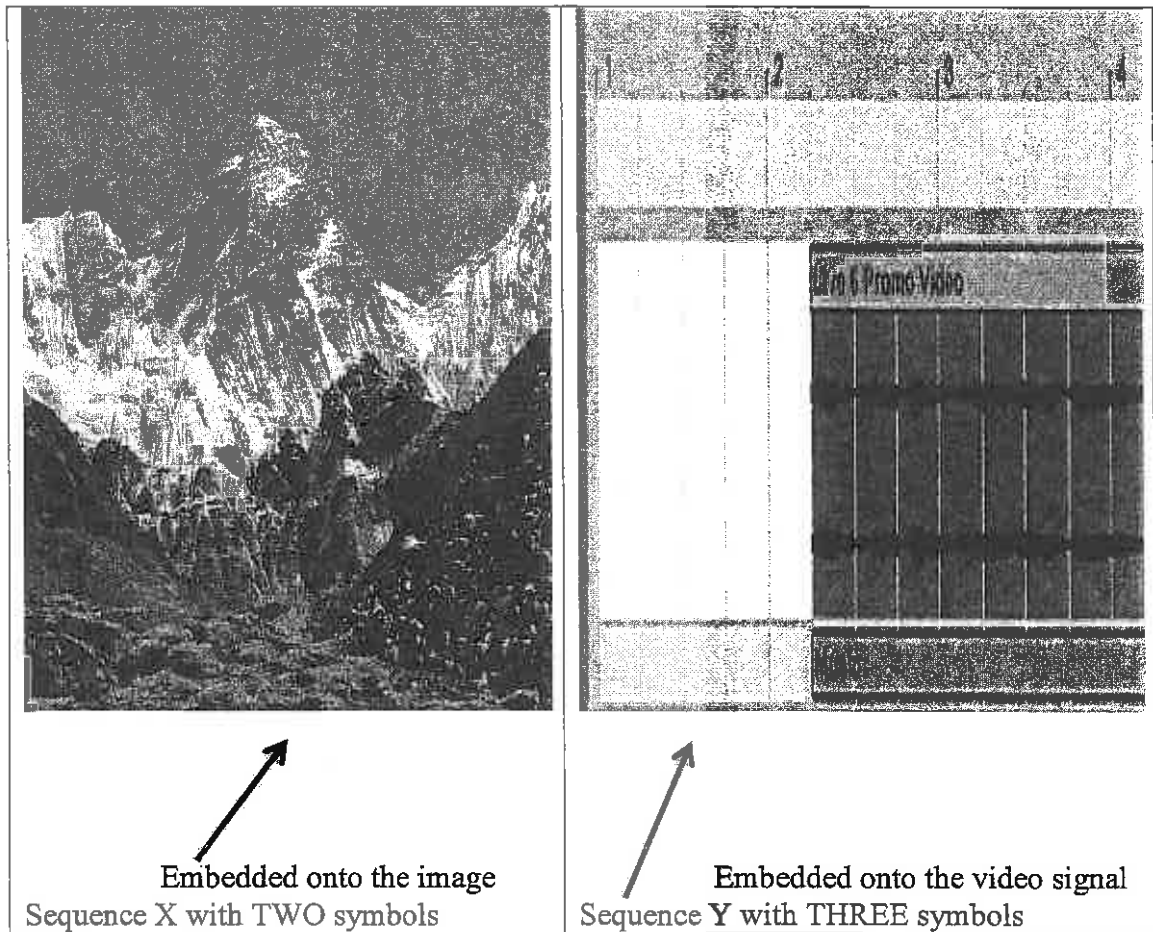
[2 marks]

CONTINUED

- (c) You have two sequences of symbols:
- Sequence X consists of TWO symbols
 - Sequence Y consists of THREE symbols

You wish to embed Sequence X onto Mount Everest image with size of 1050 by 1050 pixels (as shown in the figure below) and embed Sequence Y onto a video clip with length of 2 minutes (as shown in the figure below).

Explain how you can accomplish the tasks.

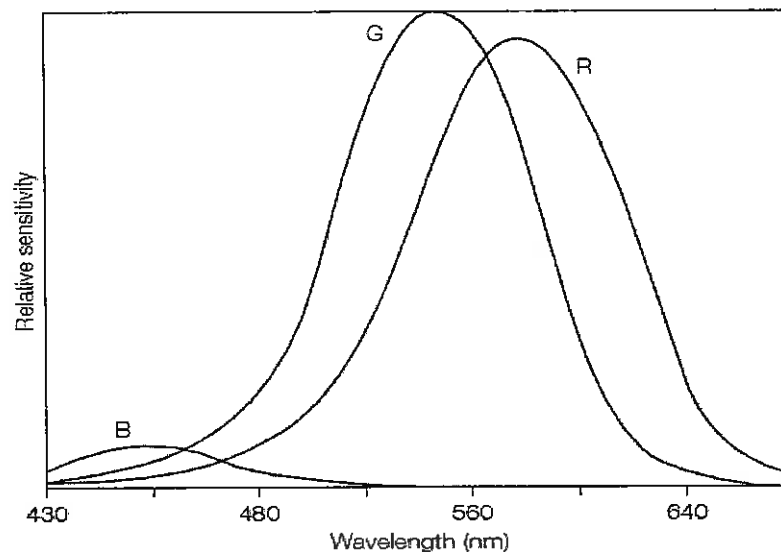


[4 marks]

CONTINUED

QUESTION 4

- (a) Figure below shows the spectral sensitivity for three different colour systems, i.e. R- Red, G - Green and B - Blue, in the normal human color vision.



John plans to place a large proportion of the watermark signals in the green channel of the RGB images. Do you agree with John's plan? Explain your answer.

Besides, describe a way to embed watermark signals in RGB images.

[5 marks]

- (b) Discriminate private watermarking from public watermarking.

[2 marks]

- (c) ***"Cryptographic techniques help in solving the problem of unauthorized decoding"***
John agrees to the statement. With your best knowledge, please help John to defend his opinion.

[3 marks]

CONTINUED

QUESTION 5

- (a) It is often possible for an adversary to perform one or more parts of an unauthorized action, even if he or she is unable to perform the action completely. Hence, it is necessary to make some assumptions about the capabilities of the adversary. Conclude the assumptions to be made about the capabilities of the adversary when judging the security of a watermark.

[4 marks]

- (b) *“Watermark robustness is a necessary property if a watermark is to be secure”*
Do you agree to the statement? Explain your answer.

[3 marks]

- (c) Many processes can be either exactly or approximately inverted. Explain the major difficulty of inverting distortions in the watermark detector.

[3 marks]

END OF PAPER